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For the Birds: Bird deterrent strategies and understanding bird activity in Ontario vineyards

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CCOVI Lecture Series

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Bird depredation

- **Birds can be hazards or a nuisance**
- **Bird depredation is a major threat to grape and other berry crops throughout Ontario and worldwide.**
- **Results in economic losses**
  - Direct loss or through disease
- **Can be unpredictable**
- **Need for good protection & not be a nuisance to human population**

Types of bird deterrents

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Acoustical repellents

- **Propane cannons (bird bangers)**
- **Electrical sound devices**
  - Random noises – irritating to birds
  - Distress calls

- **Whistling and/or pyrotechnic pistol cartridges**
- **Other devices**
  - Pie plates, noise makers

Visual deterrents

- Scare eye balloons
- Streamers and flash tape
- Flashing lights and mirrors
- Hawk silhouettes, stuffed owls and snakes

Netting

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Physical extrusion

- **Nets**

Other options

- **Chemical repellents**
- **Falconry**
- **Trapping of birds**
  - Relocation or Euthanasia

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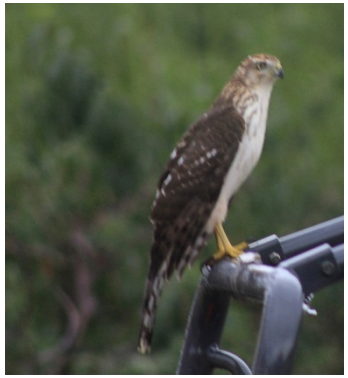
- **Shooting**
- **UAVs, dancers**



Most problematic bird species in Ontario vineyards

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Problems and solutions

- **Usually need a combination of deterrents for success**
- **Can be time consuming, expensive and not effective under high pressure situations**
- **Some of most popular methods are becoming problematic in farm/urban situations**
  - Noise makers and neighbours don't mix
- **New bird deterrent technologies may provide effective and safe bird predation control**
  - More tools in a grower's toolbox

Project Objectives

1. Test efficacy of new bird deterrents for preventing bird damage on wine grapes and tender fruit;
2. Develop methods for quantifying degree of bird pressure and estimating bird pressure and activity;
3. Determine any effects that the bird deterrent may have on bird activity/presence and;
4. Finally to improve our estimation of the level of bird damage experienced in vineyard blocks

Light based bird deterrent (2013-15)

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Experimental Design

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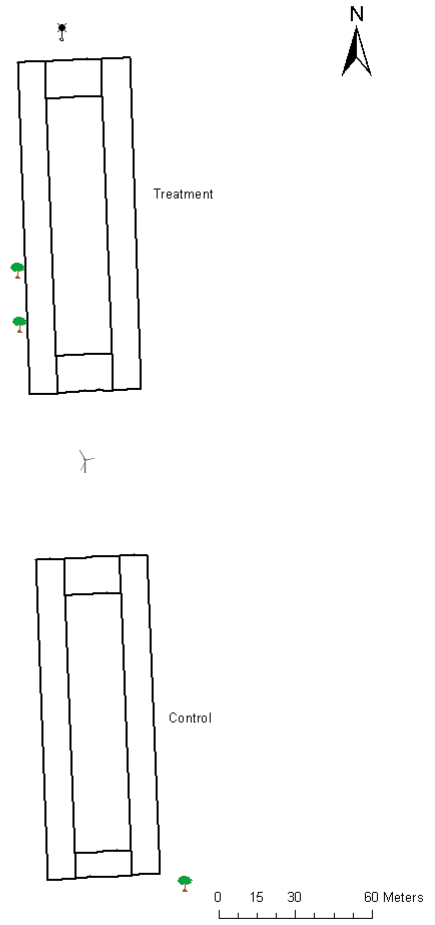
- **8 Sites in 2013** (Riesling, Pinot gris, Chardonnay, Pinot noir, Cabernet franc I and II, Cabernet Sauvignon, Merlot)
- **4 sites in 2014** (Chardonnay, Pinot noir, Cabernet franc, Cabernet Sauvignon for Icewine)
- **Criteria for sites:**
  - Power supply required
  - Power lines, tree lines, water bodies
  - Remoteness to other bird deterrents
- **5-strata system adopted**
  - 4 exterior strata, 1 interior stratum
  - Vines created grid pattern to study spatial variability of bird cluster damage



Vineyard Set up

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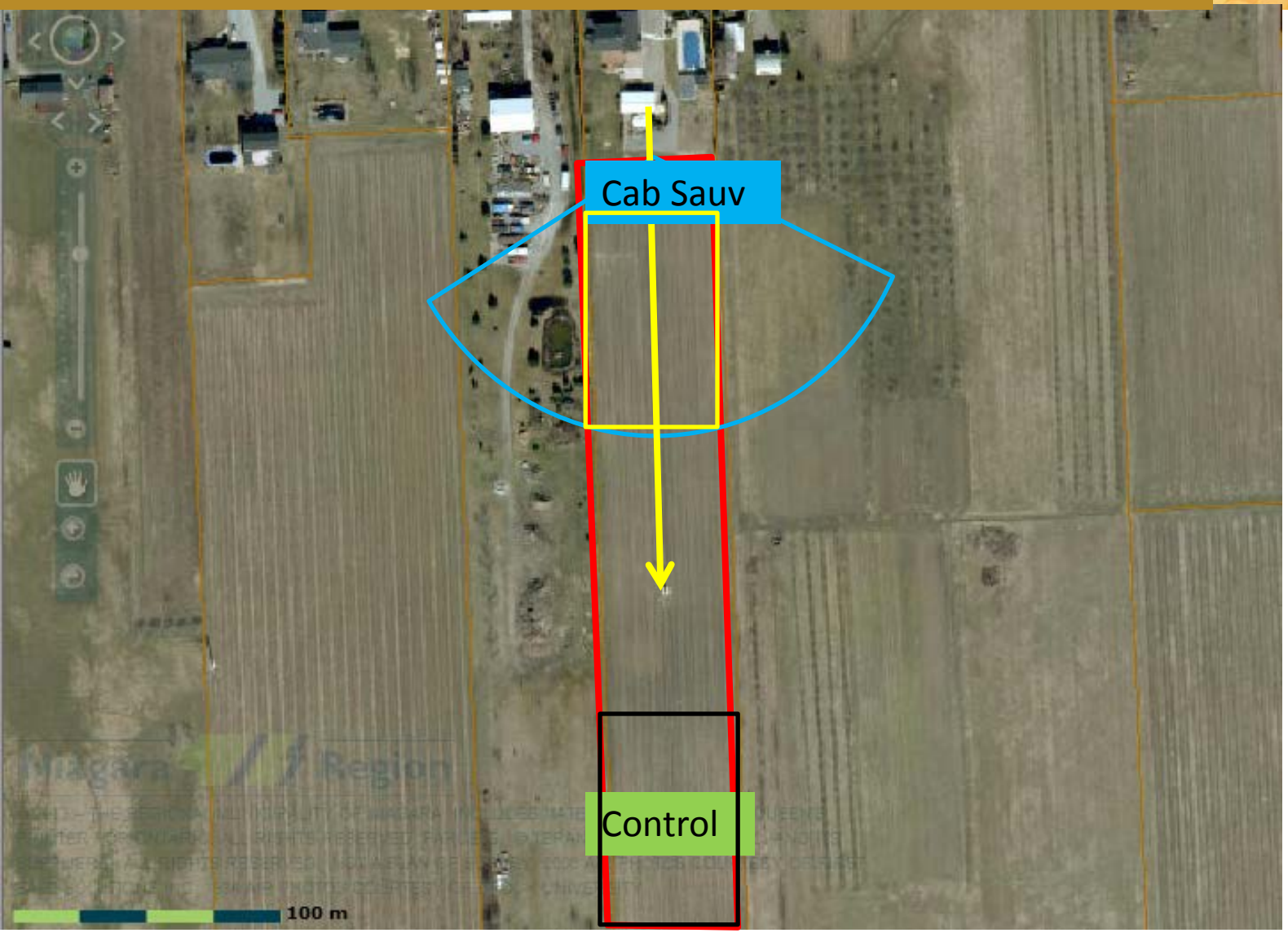

Assessing Bird activity

- **Monitored weekly at each site**
  - Abundance, distribution of bird species monitored

- **Monitored in 10 min. intervals at 3 positions (both front corners near light and interior) from dawn to 11 a.m.**
  - Birds flying over, into, out of blocks
  - Birds inside rows
  - Birds on tree lines, power lines

Bird Damage Assessments
Cluster damage

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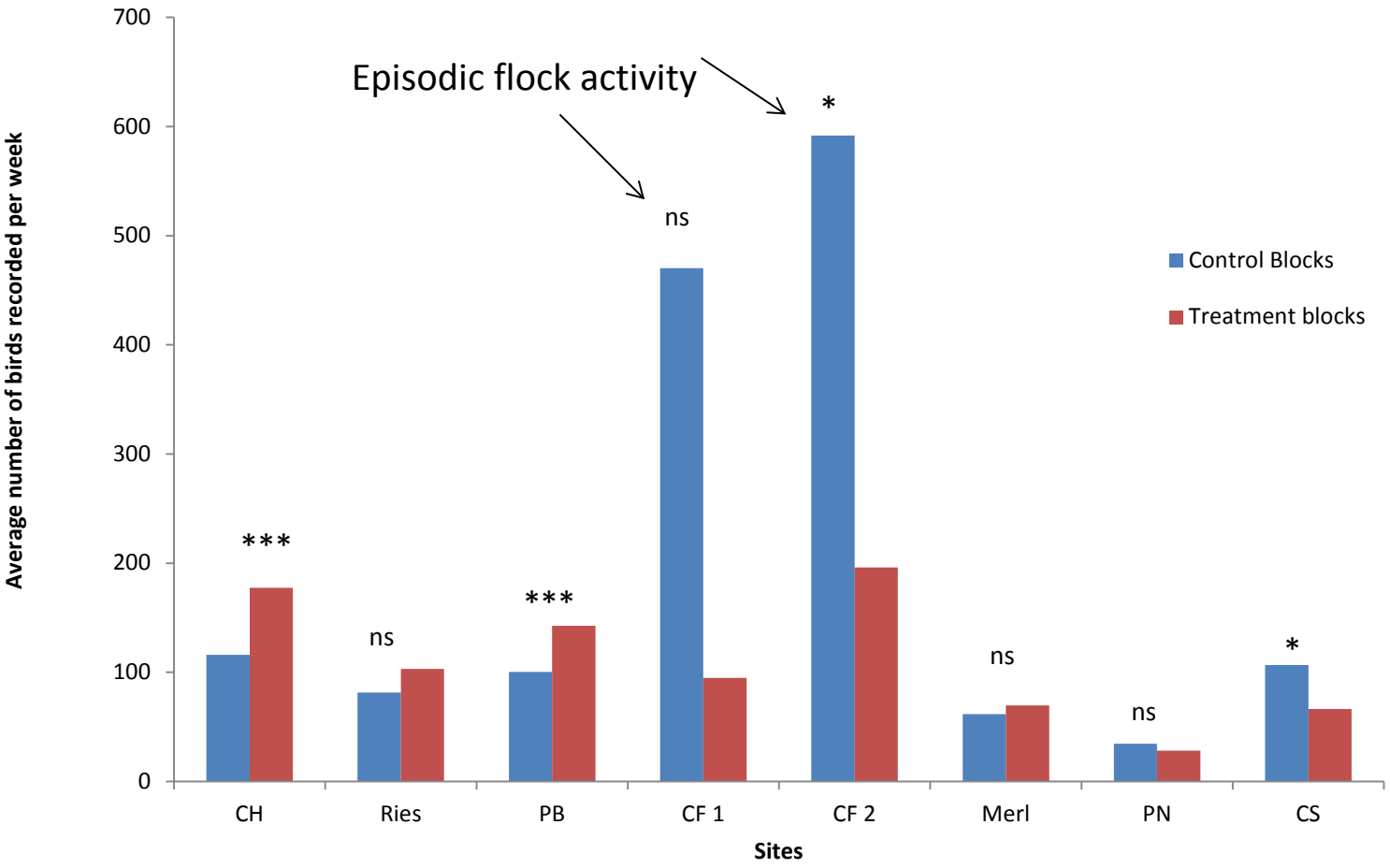
Bird Damage Assessments
Cluster damage

- Damage assessment completed on flagged vines at least three times: once at the start of veraison (baseline), once mid-way, and once before harvest
- Randomly selected clusters fully rotated to choose damage category

Numerical damage scale for assessing crop damage due to bird depredation. Derived from a linear regression graph with the equation y = 0.0443x + 1 (R2 = 0.9846).

Damage category	Percent damage to crop
1	0 - 22.6 %
2	22.6 - 45.1 %
3	45.1 - 67.7 %
4	67.7 - 90.3 %
5	90.3 - 100 %

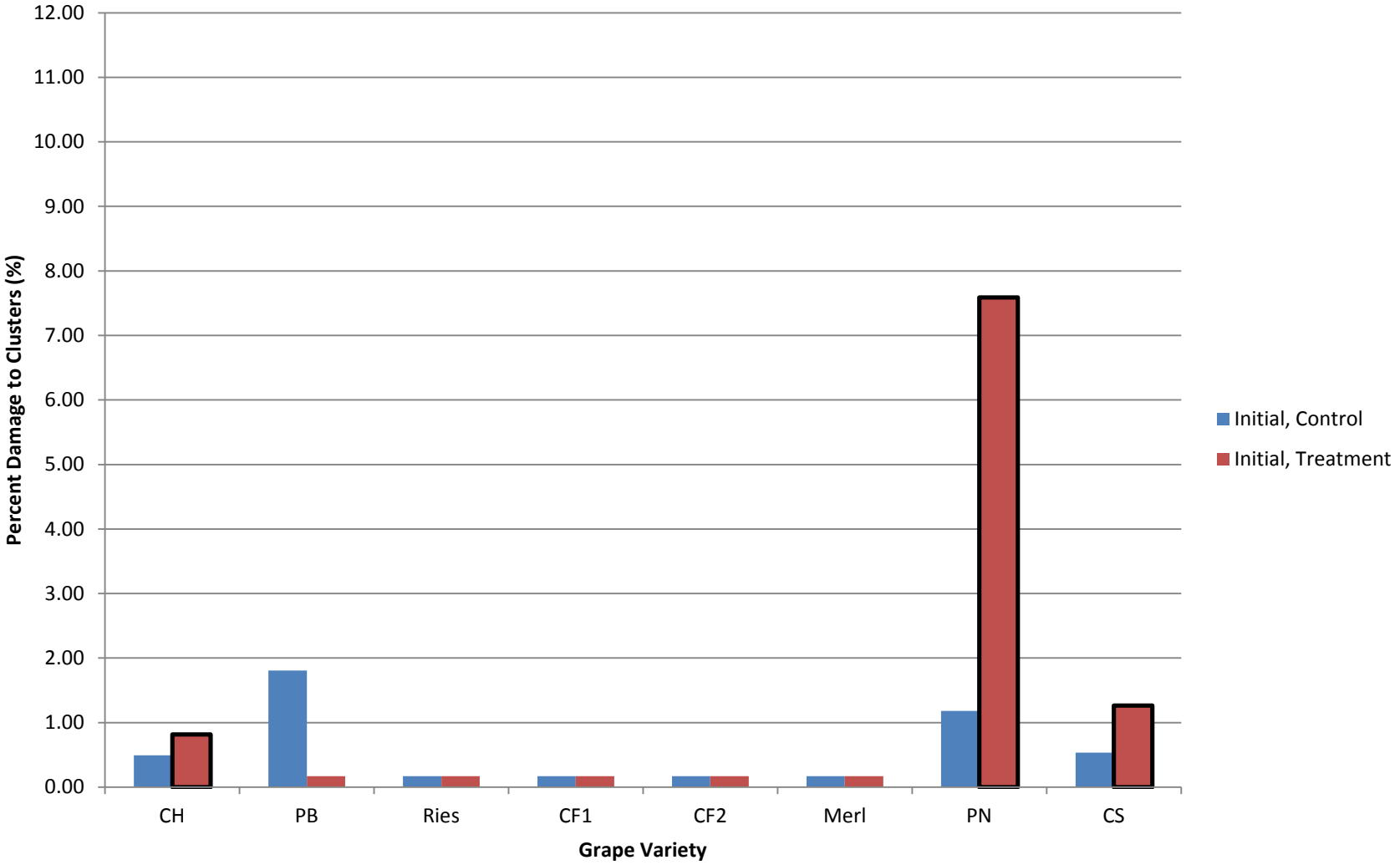
Bird Activity (2013)
Average bird activity per week



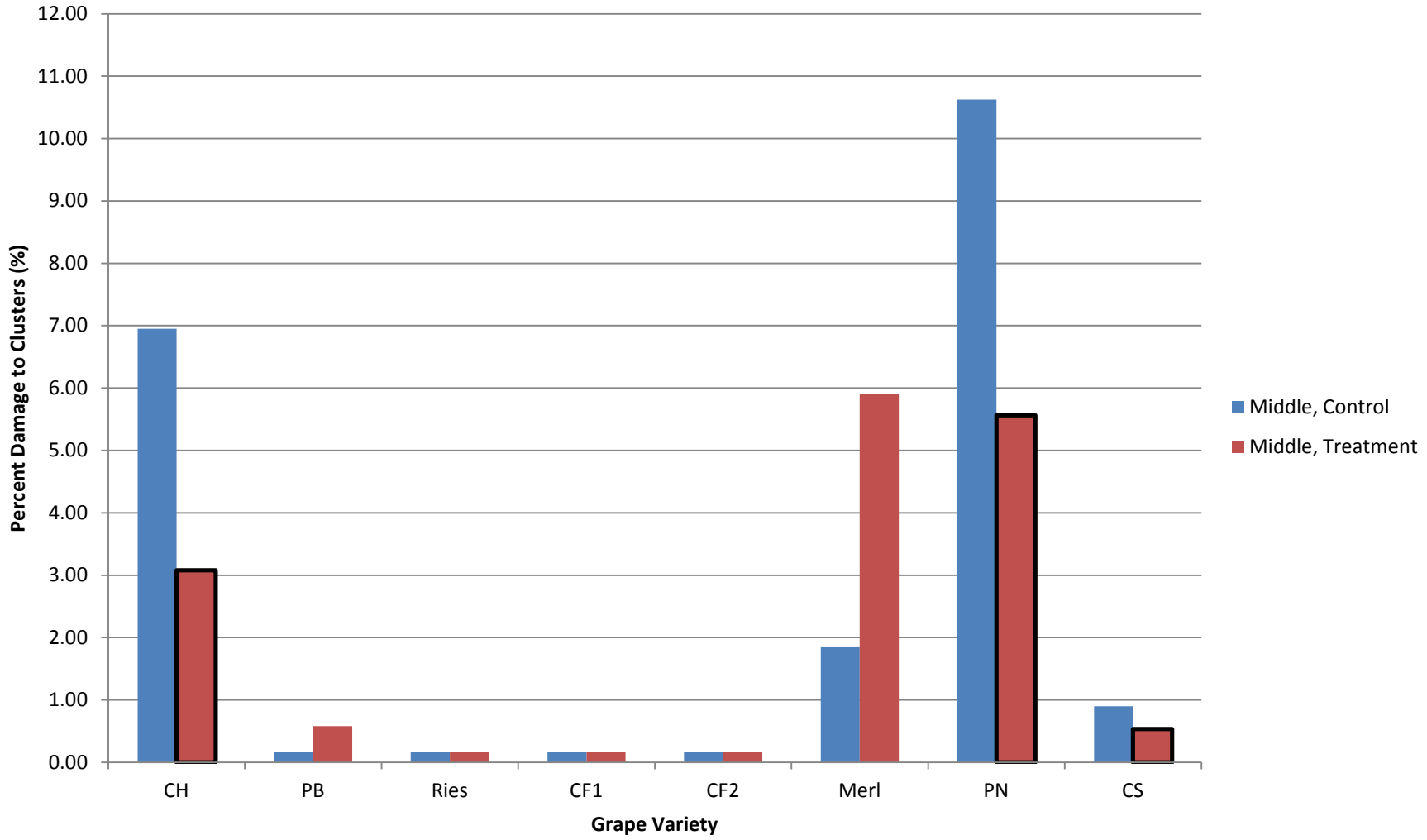
Bird Activity
Notes

- **Most common birds**
  - American Robins, European Starlings, Finch sp., sparrows
- **Seen eating grapes:**
  - American robins, eastern bluebirds, sparrows, and finches
  - No starlings were seen actually eating grapes!
- **Heavy flocking behaviour not regularly observed**
  - More common later in the season
  - Some sites had higher frequency of large flocks
- **Raptors were natural bird deterrents**

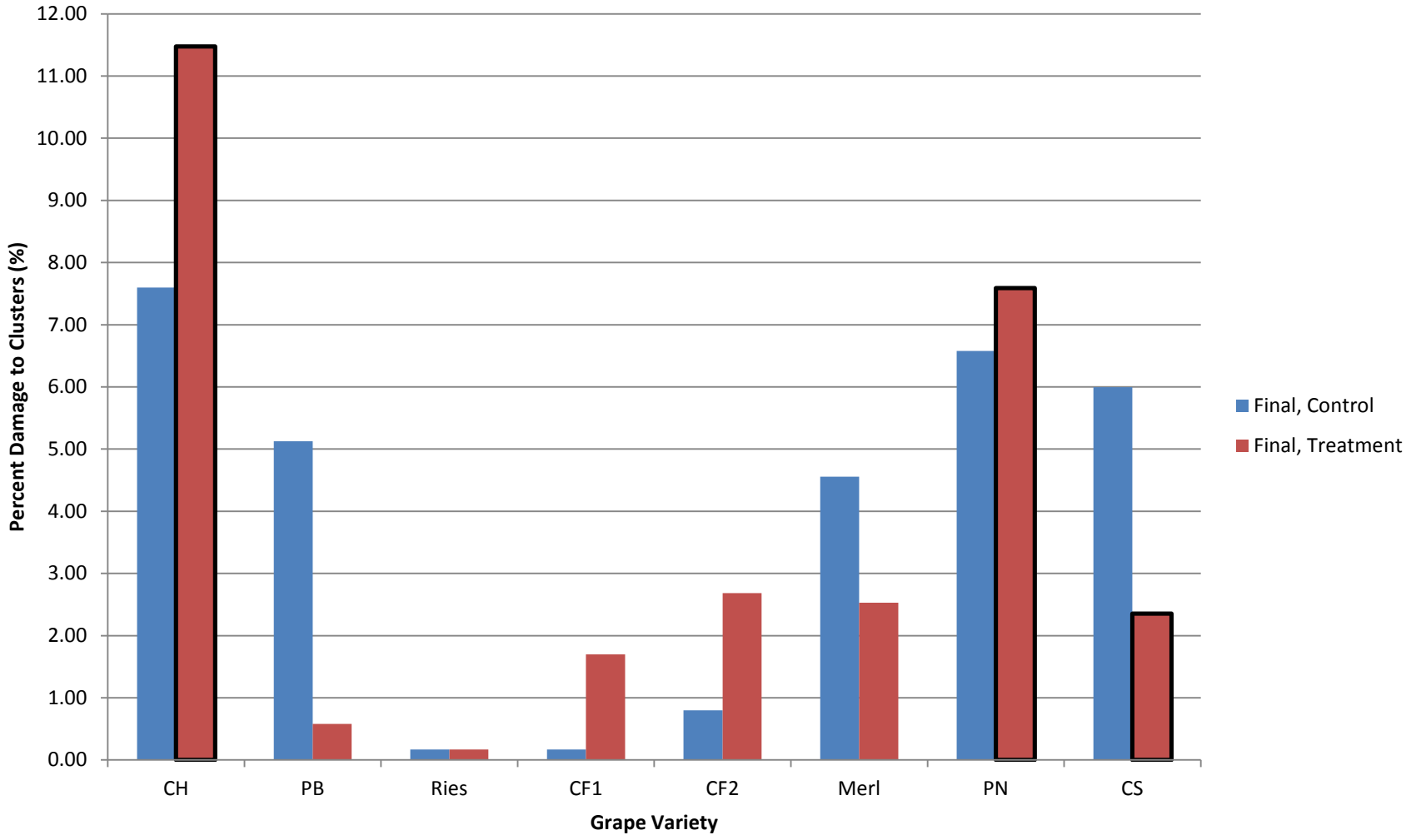
Initial bird cluster damage (2013)



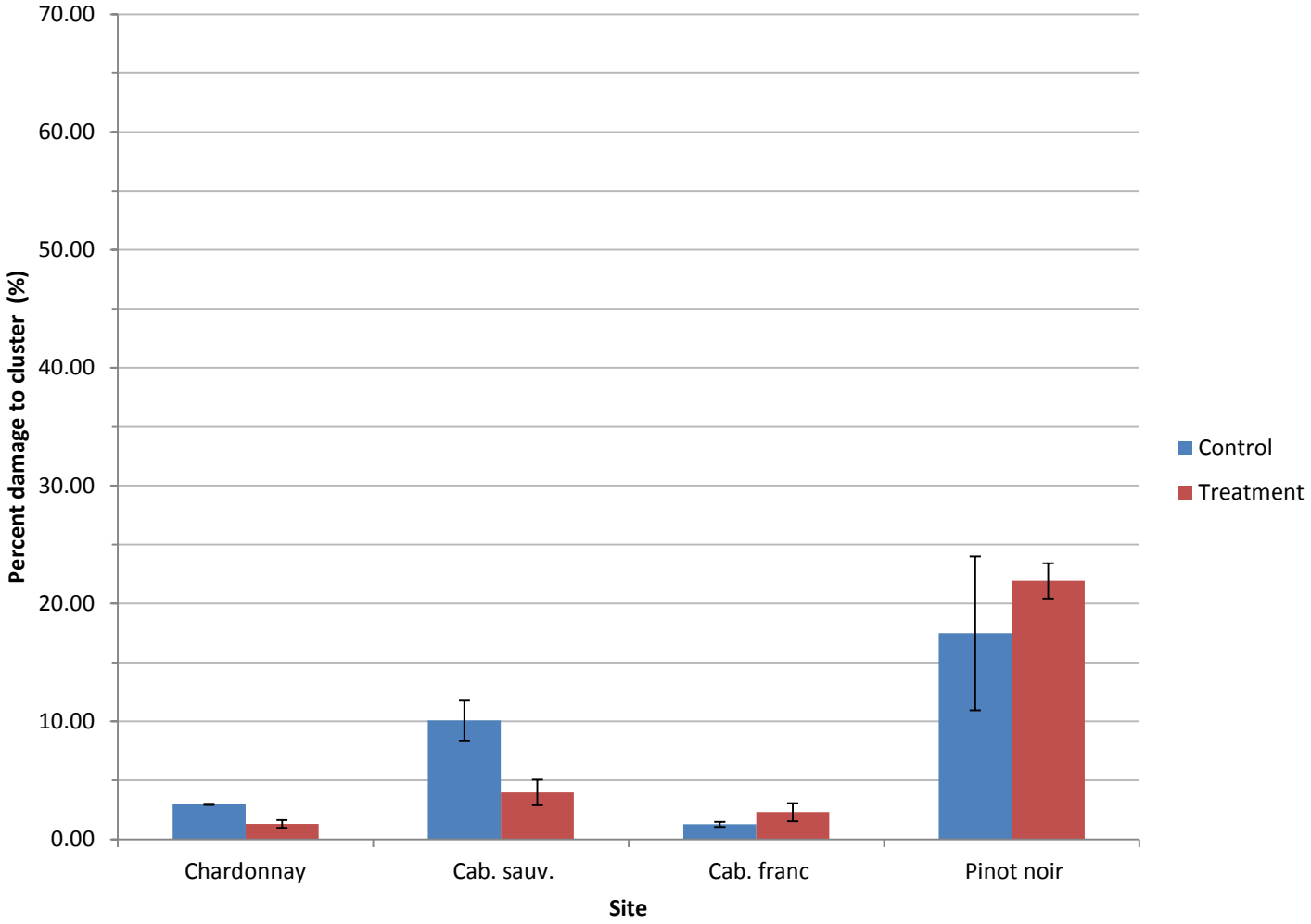
Mid-assessment bird cluster damage (2013)



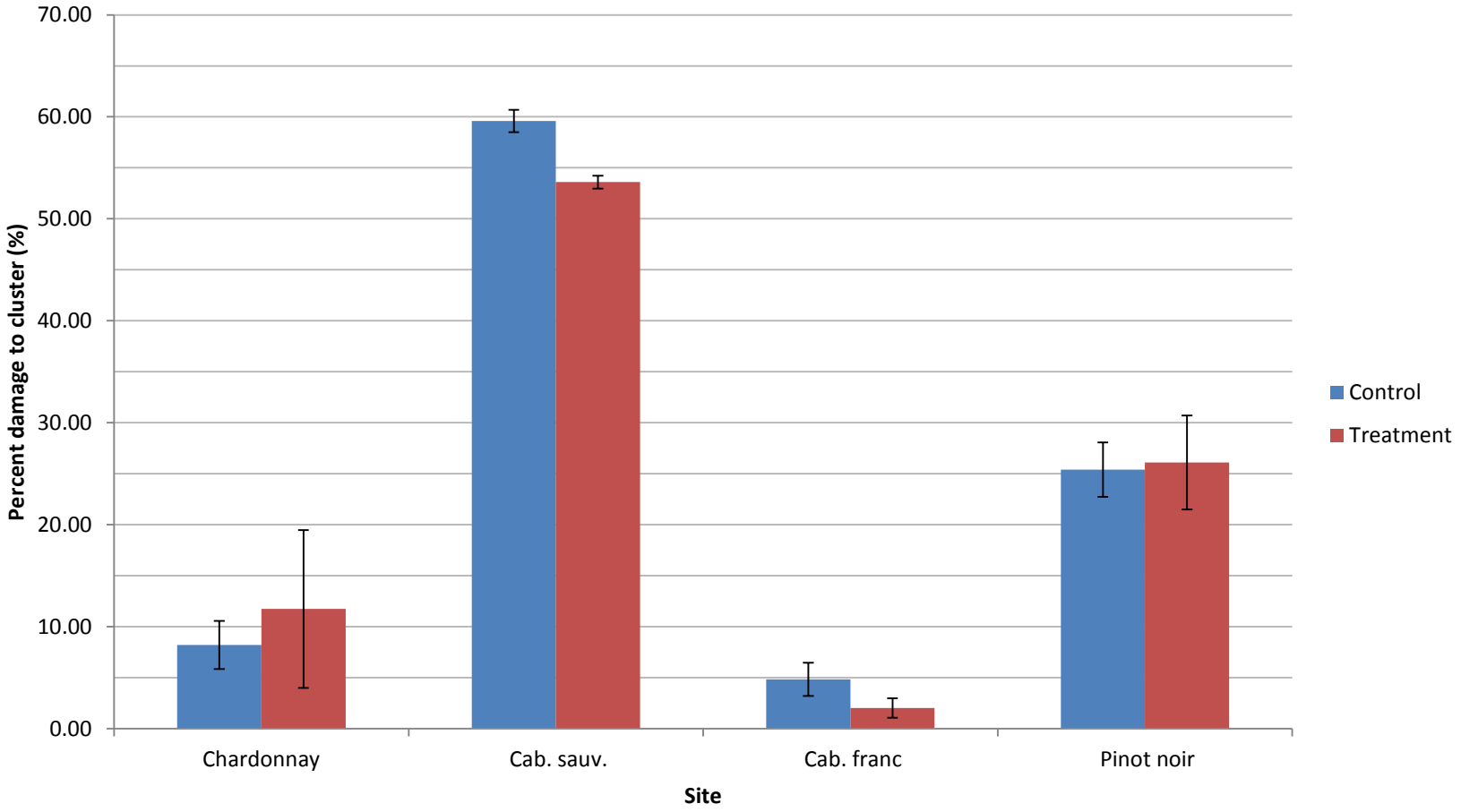
Final bird cluster damage (2013)



Mid-assessment bird cluster damage (2014)



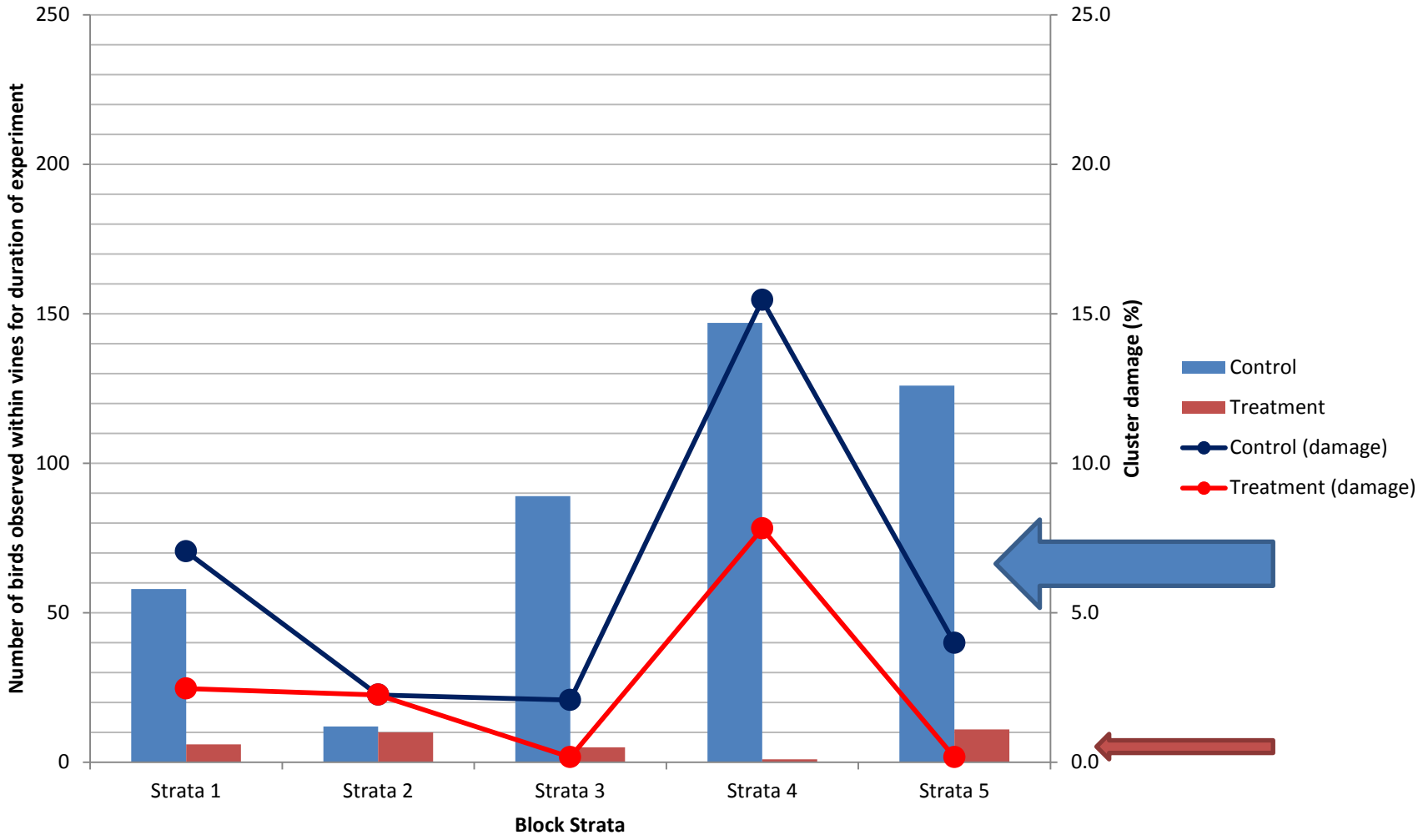
Final bird damage assessments 2014



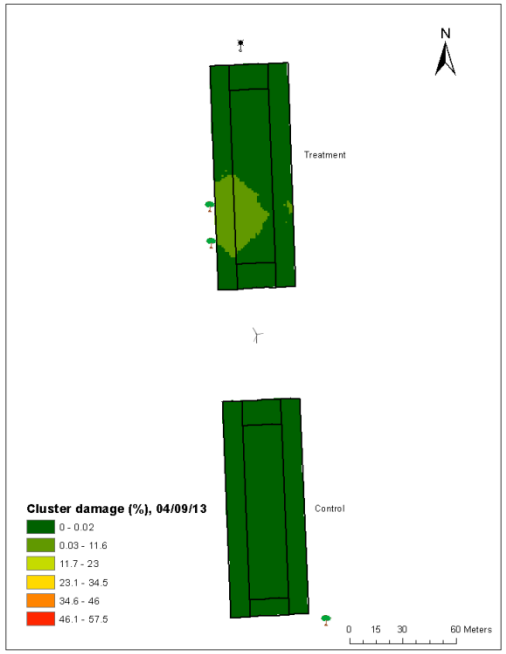
RESULTS II - Damage
Edge vs. Interior

Site		Final Cluster damage (%)	
Variety	Block	Edge (Strata 1 - 4)	Interior (Strata 5)
Chardonnay	Control	9.16	3.61
Chardonnay	Treatment	11.41	11.64
Pinot blanc	Control	6.54	2.58
Pinot blanc	Treatment	0.81	0.17
Riesling	Control	0.17	0.17
Riesling	Treatment	0.17	0.17
Cab franc 1	Control	0.17	0.17
Cab franc 1	Treatment	1.29	2.58
Cab franc 2	Control	0.60	1.38
Cab franc 2	Treatment	3.57	0.17
Merlot	Control	4.47	4.76
Merlot	Treatment	2.56	2.46
Pinot noir	Control	7.34	4.76
Pinot noir	Treatment	8.29	5.90
Cabernet sauvignon	Control	6.80	3.99
Cabernet sauvignon	Treatment	3.23	0.17

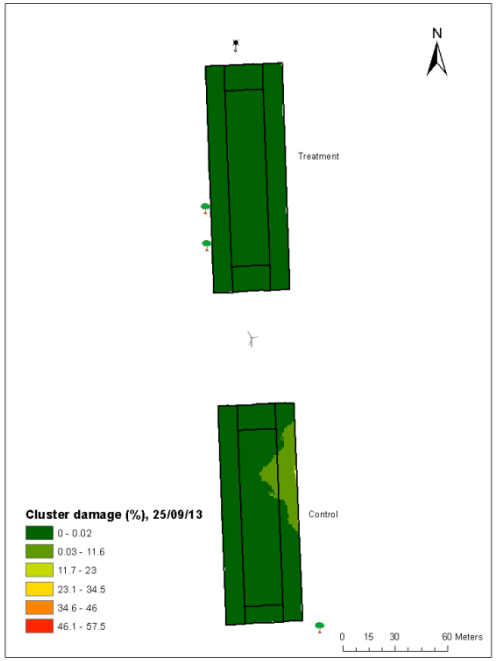
Activity and damage
Cabernet Sauvignon (2013)



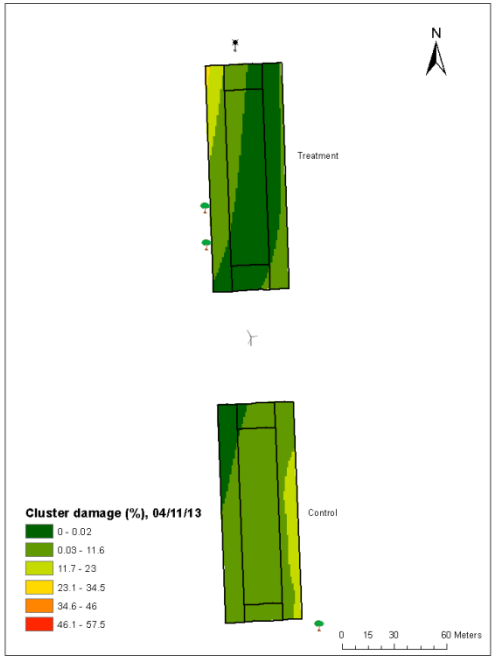
Damage
Cabernet Sauvignon maps (2013)
Light deterrent located top of upper block



September 4

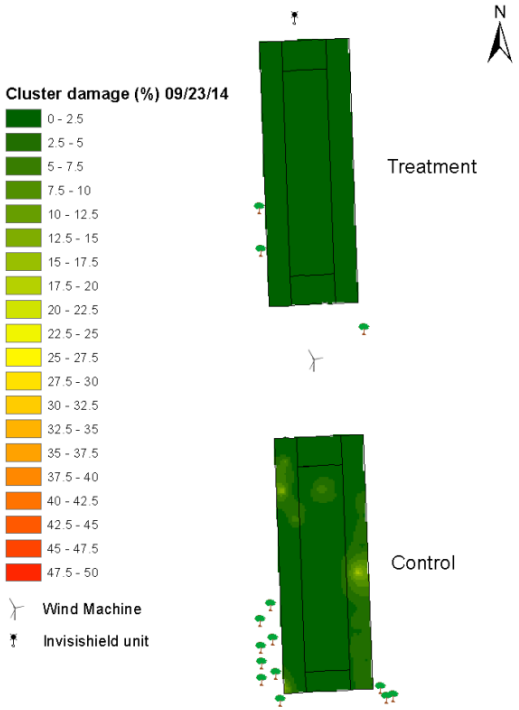


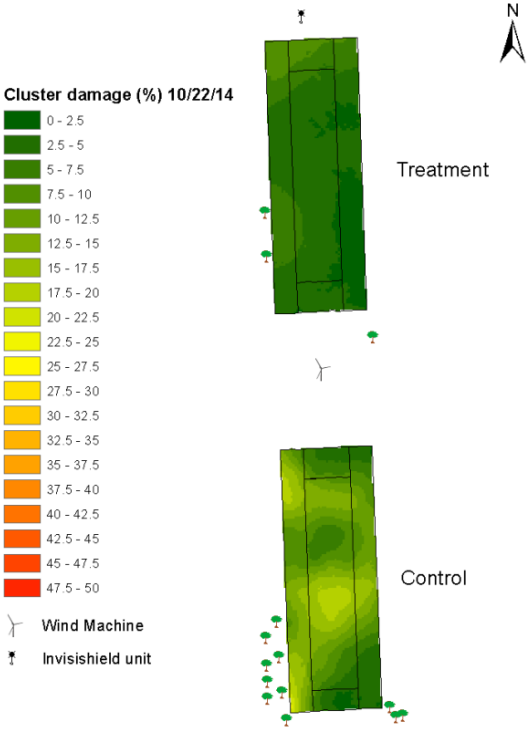
September 25

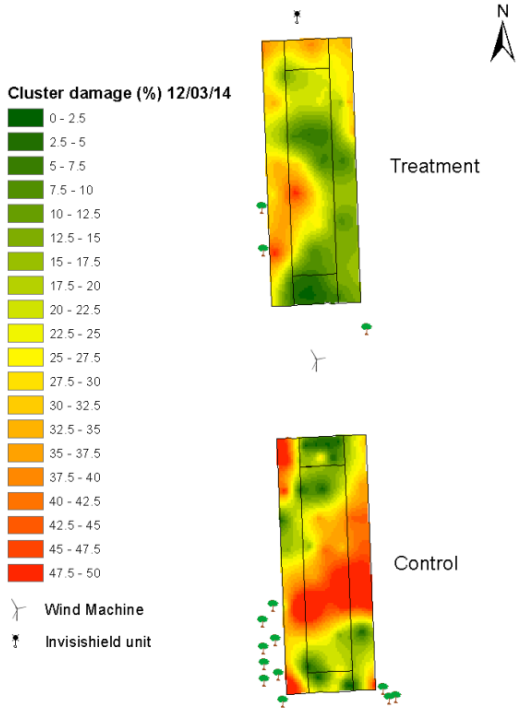


November 4

Progression of bird damage in an Icewine block (2014) Light deterrent located at top of upper block







September 23

October 22

December 3

General conclusions with light based deterrents

- **Bird pressure varied across sites and between sampling dates**
- **Damage increased as the season progressed**
  - bird pressure increased as more grapes are harvested
  - Less fruit = more damage!
- **As cluster damage to exterior regions, so does damage to the interior**
- **Use of units had some impact on bird activity**
  - Treatment blocks – seemed to limit starling flocks but robins appeared to not be bothered
  - Control blocks – more starlings
- **Ground feeders like Robins are extremely difficult to control regardless of treatments**
- **Power source requirement limited placement of units**

American Kestrel Nest Boxes (2014-16)

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Kestrel nest box locations

Site information for the 16 Kestrel nest boxes monitored during the 2015 breeding season.

Site number	Region	Crop	Year of installation
1	Vineland, Niagara Peninsula	Grapes	2014
3	Jordan, Niagara Peninsula	Grapes	2014
4	Jordan, Niagara Peninsula	Cherries	2014
5	Jordan, Niagara Peninsula	Cherries	2014
6	Jordan, Niagara Peninsula	Cherries	2014
7	Jordan, Niagara Peninsula	Cherries	2014
8	Vineland, Niagara Peninsula	Grapes	2014
9	Simcoe, Norfolk County	Blueberries	2014
10	St. Williams, Norfolk County	Blueberries	2014
11	West St. Catharines, Niagara Peninsula	Grapes	2015
12	West St. Catharines, Niagara Peninsula	Grapes	2015
13	Vineland, Niagara Peninsula	Grapes	2015
14	Vineland, Niagara Peninsula	Grapes	2015
15	Niagara-on-the-lake, Niagara Peninsula	Grapes	2015
16	Simcoe, Norfolk County	Sweet corn	2015
17	Simcoe, Norfolk County	Cherries	2015

General methodology

- **Monitored nest boxes during breeding season for occupancy**
  - General maintenance of boxes and discouraging non-native birds from using box
- **Observed boxes during occupancy for eggs and young**
- **Monitored kestrel activity when present**
- **Bird counts, activity and behaviour assessed**
- **Bird damage assessed if kestrel pair present at the site**

Pair of kestrels
Vineland, 2014

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Images of Kestrels in nest boxes

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Impact of presence of kestrels on bird counts

- Presence of kestrels in vineyard impacted bird counts and distribution of bird species
- Reduced starling populations and overall count
- Altered starling behaviour – less flocking when present

Contingency table of the number of birds recorded vs. the presence of kestrels near nest box p value = 0.001. 2014

Kestrel								Total Bird
present	Perching	Raptor	Shorebird	Starling	Swallow	Thrush	Woodpecker	Count
N	17	0	4	330	10	16	1	378
Y	14	5	0	234	23	20	1	297

Contigency table of the number of birds recorded vs. the presence of Kestrel near nest box. p value = 0.448. 2015

	Blackbird	Crow	Dove	Falcon	Finch	Flycatcher	Shorebird	Sparrow	Starling	Swallow	Thrush	Total
N	16	1	18	1	30	10	3	7	41	60	42	229
Y	18	4	12	5	19	6	4	7	30	44	37	186

Kestrel disturbing starlings when at nest box

Birds recorded vs date of observation

- Numbers and types of birds recorded changed as season progressed
- Starling numbers increased as season progressed; others fairly constant
- Kestrels present reduced # birds flying over crop

Contingency table of the number of birds recorded vs. the date of observation.. p value = 0.001. 2014

Date of observation	Perching	Raptor	Shorebird	Starling	Swallow	Thrush	Woodpecker
17/07/2014	7	2	0	110	15	12	0
24/07/2014	16	0	0	217	7	14	2
31/07/2014	8	3	4	237	11	10	0

Contingency table of the type of bird activity recorded vs. the presence of a Kestrel near the nest box
N refers to no Kestrel present; Y refers to Kestrel present. Each activity was recorded in relation to the crop area of interest. p value = 0.001

	Coming out of	Flying into	Flying over	Inside rows	Tree line
N	21	9	153	29	17
Y	22	8	92	27	37

Kestrel carrying mammalian prey

Kestrel with bird carcass at nest box

A welcome winter visitor
Eastern Screech Owl

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The Cornell Lab of Ornithology

Summary of studies with American Kestrel nest boxes

- **Successful pairs nested at 2 vineyards with another pair present at orchard**
  - 10 eggs laid with 7 successful offspring in 2015
- **Kestrels impacted bird counts and bird activity/behaviour when present**
- **Limited impact on controlling damage**
  - Kestrels are most effective during nesting and with young
- **Crops that mature earlier and coincide with kestrel nesting periods will benefit the most**
- **Screech owl occupancy during winter months may be beneficial**
- **Other native bird species utilized boxes**
  - Increase biodiversity and reduce impacts of farming on wildlife

Conclusions

- **Assessing bird activity and bird damage is a challenging task.**
- **Many site specific interactions**
  - Bird activity varies significantly between vineyard blocks in terms of pressure and species present.
  - Damage varied within vineyard blocks and between sites
- **Bird damage can result in economic losses which is likely not taken into consideration by growers.**
- **Abundance of fruit results in less % damage**
- **Smaller and/or isolated blocks, earlier maturing fruit will have more damage**

Acknowledgements

Collaborators and partners

- All grower cooperators
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Thank you

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